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Narrative and Qualitative Analyses of Workers' Compensation-Covered Injuries in Short-Haul Vs. Long-Haul Trucking Industries

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NARRATIVE AND QUALITATIVE ANALYSES OF WORKERS' COMPENSATION-COVERED INJURIES IN SHORT-HAUL VS. LONG-HAUL TRUCKING INDUSTRIES

CAPSTONE PROJECT PAPER

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ABSTRACT

Problem: Trucking transportation remains one of the most dangerous industries in the US.

The aims of the current study were to (1) identify and characterize differences in injury types between workers in short-haul and long-haul trucking; (2) analyze and code narrative text to identify and characterize the on-the-job activities associated with injuries within each trucking industry group; and (3) identify areas for targeted improvement of safety interventions.

Method: Quantitative and narrative analyses of 2012 Kentucky short-haul and long-haul truck transportation workers' compensation first reports of injury and narrative text data were performed. Chi-square tests assessed differences in demographics, injuries, award disposition, and award characteristics between short-haul and long-haul trucking industries. The top injury scenarios in short-haul and long-haul trucking were to illustrate primary work-related activities that resulted in injuries.

Results: Primary injury activity scenarios in both short-haul and long- haul trucking involved (1) moving freight; (2) tarping the trailer; and (3) handling the trailer door. A higher proportion of long-haul drivers suffered injuries due to tarping, trailer door handling, and slipping while entering or exiting the cab compared to short-haul truck drivers. In contrast, a higher proportion of short-haul drivers suffered injuries due to the vehicle leaving the roadway and being rear-ended by other vehicles.

Practical Applications: Both trucking groups may benefit from increased access to freight moving equipment and engineering control measures such as access to ladders, scaffolding and harness systems for tarping at shipping locations. Long-haul truckers specifically could benefit from the use of portable tarping systems to prevent injury. Additional injury control measures include the use of slip-resistant step covers and footwear, and the use of three points of contact to prevent falls while entering or exiting the cab.

1. Introduction

The truck transportation industry continues to have one of the highest occupational injury and illness rates in the United States, resulting in a tremendous burden of workers' compensation costs to employers (Bonauto, Silverstein, Adams, & Foley, 2006; Leigh, Waehrer, Miller, & Keenan, 2004). The Bureau of Labor Statistics (BLS) reported that in 2012 truck transportation employees were nonfatally injured at a rate of 4.5 injuries per 100 workers, compared to the national rate of 3.4 per 100 workers for all industries combined (BLS, 2013a). The BLS also reported that the rate of injuries resulting in days away from work, job transfer, or job restriction was 3 per 100 workers in the trucking-transportation industry, nearly two times higher than the rate for all industries. In 2012, the Census for Fatal Occupational Injuries (CFOI) reported 500 fatal injuries in the truck transportation industry (BLS, 2013b).

While a typical work day for a trucker involves a great deal of driving, truck drivers also engage in many additional activities multiple times a day that put them at an increased risk for occupational injuries, such as entering and exiting the cab, working from heights on trailers, physically moving cargo or other large items, coupling and uncoupling their trailers, and securing their load. Studies have shown that the majority of work-related injuries among truckers result from non-motor vehicle collision incidents, and mostly affect the neck, back, and upper extremities (Smith & Williams, 2014; Friswell & Williamson, 2010). In their study of the Washington State trucking industry, Smith and Williams. (2014) found that injuries differed based on sector and occupation, and falls from elevation and musculoskeletal injuries accounted for some of the highest

median workers' compensation claims and medical costs. The BLS found that in trucking injury cases resulting in days away from work, 36% were due to overexertion, and 29% were due to falls, slips, and trips (BLS, 2013c). Additionally, those working in other occupations within the trucking industry, such as freight loading and mechanical work, are at risk for injuries as well (Smith & Williams, 2014).

Work-related musculoskeletal disorders in the truck transportation industry could be exacerbated by the lack of regular healthcare visits and inattentiveness to existing signs of injury. One cross-sectional survey study found that of 316 US long-haul truckers, 70% had no regular healthcare visits and 42.3% had musculoskeletal disorders along with other health conditions related to their job. Of those that did seek medical attention, 20.1% waited until they were home to do so (Apostolopoulos, Sönmez, Shattell, Gonzales & Fehrenbacher, 2013). With delayed seeking of health care, on the job injuries may be more severe by the time medical attention is finally sought.

Falls from trucks may result in significant injuries and lengthy periods of time spent away from work. One study of commercial truck drivers in Ontario identified three places that truckers were most likely to fall from an elevated height: the back of the trailer, the truck step, and the cargo being transported (Jones & Switzer-McIntyre, 2003). Of the 352 workers in the study, 23.6% sustained multiple injuries, with the major injuries being sprains and strains, contusions, and fractures. The CFOI reported that of the 500 fatalities reported in the truck transportation industry for 2012, 19 were the result of a falls, slips, or trips (CFOI, 2012). Falls could easily happen to non-driver workers who are involved in cargo loading and truck maintenance procedures as well.

While not the most prevalent cause of injury, motor vehicle incidents still account for large percentages and numbers of worker injuries in the truck transportation industry. The National Highway Traffic Safety Administration (NHTSA) reported that in 2012 there were 104,000 people injured in crashes involving large trucks, an increase of 18% from the previous year (NHTSA, 2012). Of those injured, 24% were occupants of large trucks and 9% of the injuries resulted from single-vehicle crashes. A study by Bunn, Slavova, and Robertson (2013) found that during a moving semi-truck collision, the odds of an injury were 2.25 times more elevated in drivers and sleeper berth passengers who did not use safety restraints compared to those who used occupant restraints.

Few studies have utilized workers' compensation data to examine occupational-related injury types in the truck transportation industry (Smith & Williams, 2014; Bonauto *et al*., 2006). Narrative text analysis and coding of the narrative field of workers' compensation FROI can provide a more detailed analysis of certain types of injuries and may inform injury prevention strategies (Brooks, 2006; Shibuya, H., Cleal, B., Kines, P., 2010).

Kentucky Revised Statute 342.038 requires employee injuries that result in more than one day absence be reported by the employer's insurance carrier or other party responsible for workers' compensation benefits payment to the Department of Workers' Claims within one week. The first report of injury (FROI) contains employee name, age, sex, wages, and occupation of the injured employee, as well as the date and hour of the injury, and the nature and cause of the injury. To our knowledge, no studies have used workers' compensation FROI to examine differences in injury types between short-haul

and long-haul trucking industries. Shibuya et al. (2010) examined a company's truck driver accident descriptions but no studies have analyzed and coded the workers' compensation FROI narrative text to identify differences in hazardous activities between the long-haul transportation and short-haul transportation industries. Narrative analysis can supplement quantitative data analysis results and be useful in informing specific injury prevention strategies targeted toward workers in long-haul and short-haul trucking.

Using 2012 Kentucky workers' compensation FROI data, the aims of this study were to: (1) identify and characterize differences in injury types between workers in short-haul and long-haul trucking, including the top three injury types for both groups; (2) analyze and code narrative text to identify and characterize the hazardous activities associated with injuries in each trucking industry group; and (3) target areas for improved safety interventions.

2. Methods

2.1. Study data

Workers' compensation first reports of injury (FROI) data are routinely collected by the Kentucky Department of Workers' Claims and contain several coded variables, as well as descriptive free-text narrative fields that describe the injury scenarios in greater detail. Kentucky workers' compensation FROI data for 2012 were obtained for the truck transportation industry from the Kentucky Department of Workers' Claims, per a memorandum of understanding with the Kentucky Injury Prevention and Research Center. The requirements for workers' compensation in Kentucky are outlined in the Workers' Compensation Act, Kentucky Revised Statute Chapter 342 (Kentucky

Department of Insurance, 2010). All employers in Kentucky with one or more employees are required to have workers' compensation coverage for their workers. Agricultural workers are exempt from this coverage but may elect coverage.

This study was conducted at the Kentucky Injury Prevention and Research Center (KIPRC), a bona-fide agent of the Kentucky Department for Public Health. This study was part of the Kentucky Occupational Safety and Health Surveillance program, and was approved by the University of Kentucky Institutional Review Board.

2.2. Study population and selection criteria

Groups in the current study were differentiated by short-haul or long-haul status. Short-haul trucking is typically defined as operating within a radius of 150 miles or less, while long-haul trucking is defined as operating in a radius of 250 miles or more (Urban Insurance Agency, 2014). Cases within the workers' compensation database are coded using either Standard Industrial Classification (SIC) coding or North American Industrial Classification System (NAICS) coding. While NAICS is currently the official industry classification system, those submitting the FROIs often report the industry in SIC coding. There is only one industry code field, so the FROI of injury data field for industry does not capture both coding classifications. For this study, cases with the following SIC codes were selected: (1) 4212- Local trucking, without storage; (2) 4213- Trucking, except local; and (3) 4214- Local trucking and storage. Additionally, we analyzed cases with the following NAICS codes: (1) 484110- General freight trucking, local; (2) 484121- General freight trucking, long-distance, truckload; (3) 484122- General freight trucking, long distance, less than truckload; (4) 484210- Used household and office goods

moving; (5) 484220- Specialized freight (except used goods) trucking, local; and (5) 484230- Specialized freight (except used goods) trucking, long-distance. In total, there were 755 selected cases for the year 2012. NAICS code 484210, which contained 16 cases, was excluded from the study because it wasn't possible to determine if cases belonged to the short-haul or long-haul trucking groups. The total number of final cases for the study was 739.

2.3. Narrative text field analysis

An analysis of the free-text narrative field of the workers' compensation FROI was conducted in order to obtain a better understanding of the activity the claimant was engaged in at the time of injury. Four narrative activity variables were designed based on the most common activities found in the narrative fields. These were: (1) 'Lifting/cranking' related activities were all grouped together in one variable because they would typically require the claimant to exert force by lifting freight or heavy items, or by manually operating a crank. (2) 'Securing/opening/closing/adjusting' were grouped together because they would require the claimant to exert force by securing, opening, closing, or adjusting a component of the truck or load. (3) 'Truck operation' encompassed all events that took place while the claimant was driving the truck. (4) 'Maneuvering into/out of truck cab' encompasses all instances in which the claimant was attempting to enter or exit his cab or trailer at the time of injury. The authors were granted permissions to report on workers' compensation FROI data under the condition that they would not display any groups with less than 5 cases due to the possibility of personal identification. Due to this restriction, all cases that did not fit into the above

categories and did not combine to a total of more than 5 cases were grouped together in an 'other' category. Additionally, there were insufficient descriptions in the narrative portion to determine what activities were taking place in 45 (16%) of the short-haul and 109 (24%) of the long-haul trucking groups. These cases were combined with the 'other' category as well.

2.4. Groupings of injured body parts & nature of injury

Body Part, Cause and Nature were coded according to the International Association of Industrial Accident Boards and Commissions (IAIABC) coding framework. For the purpose of this study, injured body parts were re-categorized into six groups: upper extremities, lower extremities, back, multiple body parts, other soft tissue & organs, and 'other'.

2.5. Data analysis

The 2012 Kentucky workers' compensation FROI cases were stratified by trucking group (short-haul trucking *vs* long-haul trucking). Frequencies were determined for all demographic, injury, disposition, and award database variables. Frequencies were also determined for narrative activities for the truck driver occupation only among the trucking groups. Chi-squared tests were performed to assess the strength of the differences between all test variables and trucking industry groups. Statistical analysis was performed using Epi Info™ 7. Frequencies were determined to assess the top leading injury activity categories for the trucking groups.

2.6. Injury activity scenarios

The most common narrative activities were identified for both trucking groups. For each of the top three narrative activities in each trucking industry group, the ten most common activity scenarios were selected and described that represent all occupations within the short-haul and long-haul trucking industries. Narrative text analysis was also performed additionally with focus on the truck driver occupation.

3. Results

3.1. Demographics

Table 1 shows the distribution of cases for both trucking groups by demographic characteristics. There were 284 cases in the short-haul trucking group and 455 cases in the long-haul trucking group. The demographic characteristics analyzed were gender, age, length of time between hire date and injury date, trucking industry code, and occupation. The majority of workers in both trucking groups were male (95% short-haul *vs* 92% long-haul). There was a statistically significant difference in age group distributions between the trucking industries (p=.021). The 45-54 age group had the highest proportion of injuries in both trucking groups (34% short-haul, 32% long-haul). A higher proportion of short-haul trucking workers under the age of 25 were injured (8%) compared to long-haul trucking workers (3%). In contrast, a higher proportion of long-haul trucking workers aged 25-34 and 35-44 were injured at work compared to short-haul trucking workers (15% *vs* 12%, and 28% *vs* 23%, respectively).

A statistically significant difference was found in the length of time between hire date and injury date among the trucking groups (p=.049). For both trucking groups, most injuries occurred when the employee had been employed for one year or longer. However, a higher proportion of those employed in short-haul trucking (41%) than long-

haul trucking (34%) reported injuries when employed for longer than 3 years. Additionally, a higher proportion of those employed in long-haul trucking (21%) than short-haul trucking (16%) reported injuries when employed from 1 to 6 months. It should be noted that there were differences between long-haul and short-haul trucking injury reporting on length of time between hire date and injury date; there were 89 missing values for short-haul trucking (31%) and 71 missing values for long-haul trucking (16%) that were not included in the analysis.

Industry codes were reported in both NAICS and SIC coding: SIC codes were reported to 4 digits and NAICS codes were reported to six digits. Short-haul trucking cases were primarily identified with two codes: '4212-local, without storage' (49%) SIC code and '484110- general freight, local' (42%) NAICS code. For long-haul trucking injuries, the majority of cases were identified using the '4213- trucking, except local' (75%) SIC code; 25% were identified using NAICS codes for general freight, long distance, truckload, and less than truckload. Truck drivers were the leading occupation for both long-haul and short-haul truck transportation industries; there was a higher percentage of long-haul truck driver FROIs compared to short-haul truck drivers (69% *vs* 57%, respectively). Conversely, there was a higher percentage of FROIs among laborers within the short-haul trucking industry compared to FROIs within the long-haul trucking industry (15% *vs* 7%, respectively).

3.2. Injury characteristics

Table 2 describes the distribution of cases for trucking injury characteristics that include narrative activity scenarios, the top 3 causes of injury, injured body part, and

nature of injury. It should be noted that of the cases, 45 (16%) in the short-haul group and 109 (24%) in the long-haul group did not contain sufficient narrative scenario data to determine the activity taking place during injury. These cases were combined with the 'other' category.

There was a statistically significant difference in narrative activity scenarios between the trucking groups (p=.003). A higher percentage of short-haul trucking injury scenarios involved 'lifting/cranking' (31% short-haul *vs* 24% long-haul) and operating the truck (15% short-haul *vs* 9% long-haul). In contrast, a higher percentage of long-haul trucking injuries involved securing/opening/closing/adjusting activities (28% long-haul *vs* 20% short-haul).

The top three causes of injuries identified for both trucking groups were 'strain', 'motor vehicle', and 'fall, slip or trip'. The 'all other' category comprises the combined total of all other causes of injury with lower frequencies. Strains were the leading cause of injury for both trucking groups, with an equivalent proportion being found in both short-haul trucking (36%) and long-haul trucking (35%). A higher proportion of short-haul trucking workers had motor vehicle- related injuries (17% short-haul *vs* 13% long-haul). 'Fall, slip or trip' related injuries accounted for approximately the same percentages in both short haul and long haul trucking (20% and 22% respectively).

The body part most frequently injured for the short-haul trucking group was 'upper extremities' (25%) followed by 'lower extremities' (21%). Conversely, the body part most frequently injured for the long-haul trucking group was 'lower extremities' (27%) followed by 'upper extremities' (25%). 'Sprain/Strain/Tear' had the highest

frequency for nature of injury in both trucking groups, with long-haul trucking having a higher proportion than short-haul trucking (52% *vs* 45%, respectively).

3.3. Award disposition and award period

The award disposition status of the 2012 workers' compensation FROI data was analyzed to compare awarded benefits between the two trucking groups (Table 3).

There was no significant difference between the long-haul and short-haul truck transportation groups in regards to award disposition status. The null award disposition status was equivalent between both groups at 76%. FROIs that resulted in adjudicated workers' claims and were heard by an administrative law judge, and FROIs that resulted in an agreement were approximately the same percentages for both short-haul truck transportation and long-haul truck transportation industries. For the short-haul truck transportation group, 8% of the FROIs resulted in one-time payments and <1% resulted in monthly or weekly awards. For the long-haul truck transportation group, 5% of the FROIs resulted in one-time payments and approximately 1% resulted in monthly or weekly awards.

3.4. Injury activity scenarios

Many worker injury activity scenarios in short-haul and long- haul trucking involved 1) freight moving in the 'lifting/cranking' category; and 2) tarping the trailer, and handling the trailer door in the 'securing/opening/closing/adjusting' category (Tables 4 and 5). Within the short-haul trucking industry, many worker injury scenarios also included leaving the roadway and being rear-ended by another vehicle in the 'operating truck' category (Table 4). In the long-haul trucking industry, many worker injury

scenarios knee hyperextension when exiting the cab and slipping while entering and exiting the cab (Table 5).

Table 6 shows that the top three narrative activities for truck drivers in short-haul trucking were (1) ‘operating truck’, (2) ‘lifting/cranking’, and (3) ‘maneuvering into/out of truck cab’. The most common truck driver injury scenarios found in the narratives for ‘operating truck’ were being injured as a result of losing control of their truck, being struck by another vehicle from behind, and musculoskeletal injuries associated with extended routine driving. The most common scenarios found for ‘lifting/cranking’ were truck drivers becoming injured primarily when lifting cargo or other items, lifting the ramp to the trailer, or adjusting the crank when connecting the dolly to the truck. When examining injury scenarios in the ‘maneuvering into/out cab’ category, the majority of truck driver injuries involved the driver slipping, tripping, or miss-stepping as they entered or exited the cab. Additionally, many short-haul truckers were injured as a result of falling as they attempted to enter or exit the trailer.

The top three narrative activities for truck drivers employed in long- haul trucking were (1) ‘securing/opening/closing/adjusting’, (2) ‘lifting/cranking’, and (3) maneuvering into/out of truck cab (Table 7). Many truckers were injured while 1) handling the trailer door or the tarp on their load in the ‘securing/opening/closing/adjusting’ category, 2) handling freight in the ‘lifting/cranking’ category, and 3) slipping, tripping, or falling from the cab steps in the ‘maneuvering into/out of truck cab’ category.

4. Discussion

Although many studies have been conducted in regards to injuries in the truck transportation industry, this is the first known study to the authors' knowledge that utilizes state wide workers' compensation FROI to analyze differences between short-haul and long-haul injury types in the truck transportation industry. Furthermore, this is the first known study that utilizes the FROI injury description narrative field to examine injury differences between these two groups.

The use of workers' compensation first report of injury data for this present study provides a comprehensive representation of all injuries that occur in short-haul and long-haul trucking because Kentucky requires only one day off from work for injury reporting. FROIs for the year 2012 were classified into specific industries with either SIC or NAICS codes that identified whether cases were short-haul or long-haul trucking related. Workers' compensation cases contained either Standard Industrial Classification (SIC) or North American Industry Classification System (NAICS) codes for the 2012 data that were analyzed for this study. NAICS widely replaced SIC coding in 1997, therefore all census data in recent years for truck transportation industry employment has been reported using NAICS codes. We were unable to calculate injury prevalence rates since we could not determine employment numbers by SIC code. We were unable to accurately crosswalk SIC codes to NAICS codes due to insufficient information necessary to identify long-haul vs. short-haul status. The majority of cases in both groups were reported with SIC coding (55% in short haul, 75% in long haul), so it was not possible to use the NAICS industry distribution as a proxy for estimating where the SIC codes would likely fall.

The vast majority of injury cases in this study were among males. This gender distribution parallels what has been found in other research regarding trucking injury characteristics (Bunn, Slavova, & Tang, 2011; Smith & Williams, 2014; and Jones & Switzer-McIntyre, 2003). Worker injury proportions were approximately equivalent across both trucking groups. The gender disparity is likely due to the fact that the vast majority of drivers employed in the trucking industry are male (US Census Bureau, 2010). For both trucking groups, it was found that the highest proportion of injuries occurred to those workers who had been employed with the company for more than 3 years. This difference was proportionately higher in the short-haul trucking group (41%) than in the long-haul trucking group (34%). These results suggest that additional worker safety training is needed for those employed in trucking companies, particularly short-haul trucking where short-haul trucking companies may be less inclined to conduct annual follow-up worker safety training, or may not have sufficient resources to carry out worker safety trainings.

The short-haul trucking group had a higher proportion of injuries associated with the 'truck operation' (15% *vs* 9%, respectively), with many of the injuries being due to leaving the roadway and being rear-ended by other vehicles. A contributing factor to this finding could be that short-haul truck drivers often must drive in more heavily-congested traffic, putting them at greater odds for being involved in a motor vehicle incident; intrastate drivers also require less rigorous licensing and inspection processes compared to interstate drivers. While the Federal Motor Carrier Safety Administration (FMCSA) sets standards for interstate truck transportation, intrastate trucking regulations are set by the state in which the truck operates. States may vary from the FMCSA standards by

having less strict medical qualifications, lower age limits, or by allowing their drivers to operate for more hours on the road per week. Time worked could also have contributed to the higher amount of motor vehicle related injuries, considering that in 2012 intrastate drivers in Kentucky were allowed to drive 82 hours a week in comparison to the 70 a week maximum set by the FMCSA for interstate drivers. The short-haul trucking industry could benefit by increasing training initiatives involving defensive driving in congested traffic areas as well as limiting driver distractions. Truck event-monitoring systems are also available that capture video footage of the driver to give an indication of what activities may have contributed to an incident. Some brands only capture short-duration video clips in the event that there was a crash or a near-crash, which typically gives the driver less of a sense of an invasion of privacy. These video clips can then be used to further inform safety trainings.

A higher proportion of 19-24 year olds were injured in the short-haul trucking group compared to the long-haul trucking group (8% *vs* 3%, respectively). The majority of the cases in this age group in short-haul trucking were laborers followed by mechanics, with only one worker being a driver. The narrative activity with the highest frequency in those aged 19-24 in short haul trucking was ‘lifting/cranking’, with narratives showing that all injuries resulted from freight handling activities. These results indicate that young workers in the short-haul trucking group may have differing occupations, differing risk-taking tendencies, less experience in work related duties, or received inadequate worker safety training compared to 19-24 year olds in long-haul truck transportation. Workers aged 19-24 within the short-haul trucking group could benefit from trainings focused on

the safe freight handling procedures, as well as by providing access to proper freight-moving equipment.

Many long-haul truck transportation injuries involved trailer tarping and handling the trailer door. Long-haul truckers frequently manually adjust tarps on their loads, which often results in falls from the top and strains due to carrying the heavy tarps while climbing on top of the load. Several injury controls may be adopted to prevent injuries when tarping flatbed trucks. Many larger trucking companies utilize scaffolding and harness systems for fall prevention safety, which smaller trucking companies can also adopt. Scaffolding systems used at loading docks allow the worker to walk around the truck at bed level to manipulate the tarp. Harness systems consist of a fall-protection tether attached to a fixed or pivoting boom. While the harness system requires that the worker climb the load, the tether is at a length that will suspend them in midair if they fall. Whether a scaffolding or harness system is used, a forklift should be used to place the tarps on top of the load to prevent the worker from carrying them to the top. Automatic tarping systems are also available for stationary use in the warehouse, and portable versions can be retrofitted to a trailer for on-the-road access. Portable automatic tarping systems may be ideal in hazardous weather conditions such as snow, ice, wind, and rain that may make it dangerous to manually tarp a load while on extended routes. Additionally, trucking companies could provide ladders that are at least six feet in height for truck drivers to store on their truck for adjusting the tarp. To prevent injuries associated with trailer door opening, an automatic trailer door opener can be retrofitted to the inside of a box trailer that can be remotely controlled.

For both trucking groups, ‘strain’ and ‘fall, slip, or trip’ were the leading type of injury. Additionally, upper and lower extremities and the back were the most prevalent body parts injured for both trucking groups. These findings are supported by previous research regarding injury types in the truck transportation industry. Smith and Williams (2014) found that musculoskeletal disorders of the neck, back, and upper extremities were the most commonly reported injuries among trucking industry workers’ compensation claims in Washington state over a five-year period. A survey study by Spielholz *et al*. (2008) found that of 359 trucking companies and 397 commercial drivers surveyed, both trucking companies and drivers ranked musculoskeletal and slip, trip, and fall injures as the two top priority areas to be addressed in regards to worker health and safety. Another survey study of self-reported musculoskeletal work-related injuries among truck drivers in the United Kingdom found that of the 192 participants, 81% reported some type of musculoskeletal problems in the last 12 months, with the greatest proportion involving the low back as well as high numbers reporting shoulder, knee and neck problems (Robb & Mansfield, 2014). A study by Friswell and Robinson (2010) surveyed 321 short-haul transportation drivers in New South Wells and found that 46% of injuries were reported related to the back, and 45% of injuries being strains to muscles, ligaments, tendons, and joints. Strains and sprains have been associated with high medical costs (Smith & Williams, 2013).

Truck driver fall injuries due to entering and exiting the trailer cab and injuries involving freight moving ranked among the top injuries for both short-haul and long-haul trucking groups. To prevent falls, several engineering controls are recommended. First, an employer safety policy that requires slip-resistant footwear should be considered. Slip

resistant shoes should be routinely replaced when they are worn or damaged. A study of 475 restaurant workers found that shoes that were less than six months old were more effective at preventing slips than were shoes that were older than six months, and that changing to a new pair of shoes among those who wore slip-resistant shoes was associated with a 55% decrease in falls due to slipping (Verma *et al.*, 2014). If the truck step does not have an abrasive surface to prevent falls, an industrial strength slip-resistant padding can be applied that will provide increased traction. While most trucks are manufactured with some type of handle bar for support while climbing in and out of the cab, it is recommended that one be placed just inside the driver's side door that extends from the floorboard to dash height. Having the handle on the interior prevents it from getting wet, and provides ready access to drivers as they enter and exit the cab. To further prevent falls, trucking companies should implement and enforce worker safety training that emphasizes the importance of maintaining three points of contact with the truck at all times when entering and exiting the cab (i.e. one foot and two hands, or two feet and one hand).

There were several limitations to the present study. First of all, the narrative fields for 45 (16%) of workers in the short-haul group and 109 (24%) of workers in the long-haul group could not be properly coded into a narrative activity because they were lacking in sufficient information. Second, there was a lack of denominator data for the short-haul and long-haul groups to determine prevalence rates. Third, due to insufficient data, there were 89 missing values for short haul trucking (31%) and 71 missing values for long-haul trucking (16%) when analyzing the length of time between hire and injury dates. Last, workers' compensation data is reported by a variety of different sources and

may, therefore, differ in reporting completeness, and specificity. Sources may include doctors, insurance agents, employers, or even the claimant themselves. With these limitations, the study results are relatable to the trucking industry since many of the identified injury types were consistent with what has been observed in other research studies.

5. Impact on industry

Several findings in this study could be used to inform injury prevention strategies in short and long haul trucking. Both of the trucking groups could benefit by ensuring that all employees are properly trained on routine tasks such as safely lifting and moving freight and tarping procedures of the trailer. Additionally, workers in both groups should be provided with ready access to freight moving equipment and tarping safety mechanisms. Access to ladders, scaffolding, and harness systems can be provided to prevent injuries associated with the tarping process of a flatbed truck. Truck drivers working in the long-haul trucking group may benefit from portable tarping mechanisms installation on their trailers to reduce manual tarping during their extended routes. Trucker drivers working in the short-haul trucking group could benefit by having training focusing on safe driving procedures, and by implementing even-monitoring systems. Worker safety training could also focus on safely performing manual tarping procedures during windy, icy, or wet conditions to prevent injuries from falls. All workers in both groups, especially truck drivers, could benefit by installing industrial strength slip-resistant padding to steps, providing interior handle bars that reach from the floor to the dash, and by requiring that all drivers wear slip-resistant shoes. Additionally, there should be an increased focus on training that emphasizes the importance of three points of

contact when entering or exiting the cab. Both trucking groups could benefit from general follow-up training on an annual basis, as the majority of injuries in both groups were to those who had been employed for one year or longer.

Further research needs to be conducted that analyzes differences among short-haul and long-haul trucking companies. A deeper look into the contributing factors of injury types in short-haul and long-haul trucking is necessary to understand differences among the various activities associated with injury (e.g. workers perception of risk, safety equipment and PPE available, medical histories, training records).

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Table 1. Demographic Characteristics of Short-haul vs. Long-haul Trucking Industry Injuries, 2012.

Demographic Characteristic	**Short-haul Trucking**	**Long-haul Trucking**	***p*-value[a]**
Gender	***n*= 284**	***n*= 455**	
Male	270 (95%)	420 (92%)	0.142
Female	14 (5%)	35 (8%)	
Age			
19-24	22 (8%)	14 (3%)	0.021
25-34	33 (12%)	67 (15%)	
35-44	64 (23%)	129 (28%)	
45-54	97 (34%)	146 (32%)	
55-64	57 (20%)	89 (20%)	
65+	11 (4%)	10 (2%)	
Average Age	45.51	45.37	
Length of Time Between Hire & Injury*			
< 30 days	20 (10%)	21 (6%)	0.049
≥ 1 month < 6 months	31 (16%)	79 (21%)	
≥ 6 months ≤ 1 year	24 (12%)	63 (16%)	
> 1 year ≤ 3 Years	40 (21%)	91 (24%)	
> 3 Years	80 (41%)	130 (34%)	
Missing Values	89	71	
Trucking Industry Code			
4212- Local, Without Storage	139 (49%)	0 (0%)	
4213- Trucking, Except Local	0 (0%)	339 (75%)	
4214- Local and Storage	16 (6%)	0 (0%)	
484110- General Freight, Local	119 (42%)	0 (0%)	
484121- General Freight, Long Distance, Truckload	0 (0%	57 (13%)	
484122- General Freight, Long Distance, Less than Truckload	0 (0%)	54 (12%)	
484220- Specialized Freight, Local	10 (4%)	0 (0%)	
484230- Specialized Freight, Long Distance	0 (0%)	5 (1%)	
Occupation			
Truck drivers, heavy and light	162 (57%)	316 (69%)	0.006
Unknown	53 (19%)	64 (14%)	
Laborer	42 (15%)	34 (7%)	
Mechanic	12 (4%)	17 (4%)	
Administrative/Managerial	8 (3%)	10 (2%)	
Other	7 (2%)	14 (3%)	

[a]Chi-square test

Table 2. Injury Characteristics of Short-haul vs. Long-haul Trucking, 2012.

Injury Characteristic	**Short-haul Trucking**	**Long-haul Trucking**	***p*-value[a]**
Narrative Activity	***n*= 284**	***n*= 455**	
Lifting/Cranking	88 (31%)	110 (24%)	0.003
Securing/Opening/Closing/Adjusting	56 (20%)	127 (28%)	
Truck Operation	43 (15%)	42 (9%)	
Maneuvering Into/Out of Truck Cab	34 (12%)	47 (10%)	
Other	63 (22%)	127 (28%)	
Top 3 Types of Injury			
Strain	103 (36%)	158 (35%)	0.318
Fall, Slip, or Trip	57 (20%)	101 (22%)	
Motor Vehicle	49 (17%)	59 (13%)	
All Other	75 (26%)	137 (30%)	
Injured Body Part			
Upper Extremities	71 (25%)	113 (25%)	0.529
Lower Extremities	60 (21%)	123 (27%)	
Back	57 (20%)	81 (18%)	
Multiple Body Parts	43 (15%)	67 (15%)	
Other Soft Tissue & Organs	24 (8%)	35 (8%)	
Other*	29 (10%)	36 (8%)	
Nature of Injury			
Sprain/Strain/Tear	127 (45%)	236 (52%)	0.294
Other	74 (26%)	106 (23%)	
Contusion	34 (12%)	51 (11%)	
Fracture	25 (9%)	36 (8%)	
Multiple Injuries	24 (8%)	26 (6%)	

[a]Chi-square test

Table 3. Kentucky Workers' Compensation First Reports of Injuries by Award Claim Disposition and Period, 2012.

Award Characteristic	**Short-haul Trucking**	**Long-haul Trucking**	***p*-value[a]**
Award Disposition	***n*=284**	***n*=455**	
(None)	217 (76%)	346 (76%)	0.059
Set for Hearing with Administrative Law Judge	40 (14%)	62 (14%)	
Agreement Approved on First Report	25 (9%)	42 (5%)	
Other	2 (1%)	5 (1%)	
Award Period			
Null	256 (90%)	419 (92%)	0.335
One-time payment	24 (8%)	25 (5%)	
Monthly/weekly	1 (<1%)	4 (1%)	
Missing values	3 (1%)	7 (2%)	

[a]Chi-square test

Table 4. Top Injury Scenario Activities For All Occupations In Short-Haul Trucking, 2012.

1. **Lifting/Cranking (*n*= 88, 31%)**
   - *"EE was putting carrier housing in truck, strained small part of back"*
   - *"He was lifting a driveshaft from a truck and felt pain in his right lower stomach"*
   - *"While lifting gallon jug up to fill engine oil, felt pain in his right shoulder"*
   - *"Employee unloading cabinets off of a truck. Felt strain in lower back right leg after activity"*
   - *"Carrying merchandise onto truck and misstepped between truck and dock plate"*
   - *"He was pulling on a pallet of freight when he felt pain in his lower back"*
   - *"He was unloading freight from a trailer and strained his back"*
   - *"Back pain- He said he was picking up an oil line and felt something pull in back"*
   - *"He was pulling 8 foot long crates from the nose of his trailer"*
   - *"IW was pulling on something and felt a pain in his abdomen"*

2. **Securing/Opening/Closing/Adjusting (*n*= 56, 20%)**
   - *"The IW experienced right shoulder pain while he was cranking tarp cover off of a loaded trailer"*
   - *"The ratchet slipped- his knee went one way and his foot went another"*
   - *"Pulling a chain to secure a coil on a flatbed tractor trailer when the chain gave away causing him to fall off the trailer"*
   - *"Wrist-tarping truck, fell getting down and caught fall with wrist"*
   - *"Contusions/L shoulder, ribs, back. Fell when strapping down truck"*
   - *"On back of truck checking tarp fell off truck"*
   - *"Strain/abdomen/closing door on trailer"*
   - *"He dropped trailer and went to next stop/ bent over to open trailer door, experiencing neck pain"*
   - *"He was pulling his lift gate when his foot slipped off the bumper and he fell. He tried to catch himself and hurt his left wrist"*
   - *"Upon entering quarry, entered safe zone, exited truck, went to rear of truck and proceeded to pull tailgate to remove debris and heard shoulder pop"*

3. **Operating Truck (*n*= 43, 15%)**
   - *"EE drive company vehicle head on into a tree at a speed of less than 40 mph causing trauma and minor cuts to his body from impact"*
   - *"Trunk, pelvis sprain/EE driving, spring hanger broke truck veered to side road"*
   - *"Soreness, upset stomach- drove on soft shoulder, overturned"*
   - *"MVA hit guardrail"*
   - *"Multiple/multiple/rear ended by other driver"*
   - *"Multiple/head, r hand/rear ended by other vehicle"*
   - *"Restrained driver. IW states he saw ford explorer coming up behind him IW tried to pull over to side of road and was struck from behind"*
   - *"Multiple contusions arms, legs, chest shoulder- while driving on a narrow road, truck slipped off edge of road causing truck to turn on its side"*
   - *"Strain/neck/EE pulled out in front of other vehicle"*
   - *"Leaving strip job loaded with coal. Going uphill. Truck rolled back and turned over."*

Table 5. Top Injury Scenarios For All Occupations In Long-Haul Trucking, 2012.

1. **Securing/Opening/Closing/Adjusting (*n*= 127)**
   - *"Pulling tarp on a load for 200ft and pulled muscle from neck down to fingers"*
   - *"Pushing rolling cover over and hurt lower back"*
   - *"Employee tightened straps down to secure load, and suffered a right shoulder sprain"*
   - *"Releasing load strap, felt pop in shoulder/RT shoulder acute strain"*
   - *"EE was walking between skids on his trailer. Foot got stuck and EE fell between"*
   - *"Pulled on tool box handle came off, lost balance, fell off trailer"*
   - *"Employee hurt right shoulder while trying to close trailer doors"*
   - *"Raising trailer door up and felt pop and pain in shoulder"*
   - *"EE states he was closing hood of truck when he stepped on a rock in the graveled parking lot and twisted his ankle causing pain"*
   - *"He was pulling the 5th wheel pin release and he pulled a muscle in his right forearm"*

2. **Lifting/Cranking (*n*= 110)**
   - *"EE bent over to pick up a ramp end that is approximately 75lbs and back popped at that time"*
   - *"Picked up a deck board inside a trailer to put on a rack when he felt something in his right arm pull"*
   - *"EE strained back from repetitive lifting of packages"*
   - *"IW picked up a tire from the floor and felt a pop in his right elbow"*
   - *"While restacking a skid of freight, EE felt pain and pull in the groin"*
   - *"EE sustained a hernia to stomach area while lifting"*
   - *"EE sustained a strain to low back while lifting"*
   - *"Claimant states that he was lowering dolly legs on the trailer and the dolly crank was very hard injuring his R shoulder/arm"*
   - *"Felt pull in back while cranking down trailer/back strain"*
   - *"Driver squatted down to hook up hose and felt severe pain in left knee"*

3. **Maneuvering Into/Out of Cab or Trailer (*n*=47)**
   - *"Slipped off top step of tractor and fell to the ground landing wrong on left foot"*
   - *"He was stepping out of his truck and his left leg gave out, his knee buckled"*
   - *"EE was getting out of truck, he missed the hand grip on the side and fell backwards"*
   - *"Climbing out of truck and hyperextended knee"*
   - *"Employee miss-stepped while getting off truck and hyperextended left knee"*
   - *"Claimant states that he slipped entering the truck and fell backwards hitting his head on the ground"*
   - *"Slipped and fell getting out of truck/ankle sprain"*
   - *"Climbing out of back of semi trailer, stepping down, slipped and fell to the ground. Upper left leg strain"*
   - *"Pull self climbing into truck bed"*
   - *"Claimant states that he was attempting to enter the trailer and slipped*

Table 6. Top Injury Scenarios for Short-haul Truck Drivers, 2012.

1. **Operating Truck (*n*=39, 24%)**
   - *"Driver was in left lane when a lady passed him and lost control of her car and spun into the trailer"*
   - *"He was involved in a single-vehicle accident. Ran off road. The truck jack-knifed"*
   - *"Driving the truck downhill the truck slipped from the ground being so muddy"*
   - *"Turned rig over while turning into customer's location"*
   - *"Employee stated that his ankle just started hurting while he was driving, didn't know how or when injured"*
   - *"Unsure- states that he sat in the truck from Sunday to Thursday and his back started hurting"*
   - *"Right shoulder strain. Employee was driving a truck and hit a light pole going approximately 5 mph"*
   - *"Strain to neck. EE pulled out in front of other vehicle"*
   - *"Saw truck coming up behind him, tried to pull over to side of road and was struck from behind"*
   - *"Multiple, head and right hand. Rear ended by other vehicle"*
2. **Lifting/Cranking (*n*=39, 24%)**
   - *"Employee was lifting ramp onto trailer when he felt a sharp pain in his back"*
   - *"Unloading. Delivering a large entry door and the weight of the door cause his back to hurt"*
   - *"Was loading unit when he slipped on gravel and pulled left hamstring"*
   - *"Employee was loading unit and going in and out when he felt pain from twisting, etc."*
   - *"Employee unloading cabinets off of a truck. Felt strain in lower back right leg after activity"*
   - *"Low back injury. Employee was loading cars, lifted the ramp attached to the trailer and felt a pull in his lower back"*
   - *"Employee was pushing in his skid ramps on his trailer and felt pain in low back"*
   - *"EE was lifting ramp, stood up, walked a few steps and felt pain"*
   - *"Turning crank on trailer loss hurt back"*
   - *"He was cranking the dolly on his trailer and strained his abdomen"*
3. **Maneuvering Into/Out of Cab or Trailer (*n*= 28, 17%)**
   - *"Driver was getting out of truck and lost his balance causing him to fall. He tried to catch himself with his hands and fractured wrist"*
   - *"Driver was exiting tractor and strained his right knee"*
   - *"Right knee injury. Employee stepped out of truck onto step and his foot got stuck. He turned and felt knee pop"*
   - *"Employee exiting cab mud on shoes slipped reached to grab pulled causing sprains to right elbow and right rotator cuff"*
   - *"Bilateral hand contusions and swelling. Employee was exiting trailer and he tripped over a chain, falling on both hands on the concrete"*
   - *"IW was climbing out of tractor it was dark so the driver stepped into a hole in the parking lot causing him to twist his left ankle"*
   - *"IW was getting off of his tuck, IW slipped on the stairs of the truck and fell on the pavement"*
   - *"Twisted hip & back- fell getting out of truck to get lunch"*
   - *"Contusion/strain to left wrist, right knee and right hip: employee fell while getting off side of trailer, tripped and fell about 1 foot to the ground"*
   - *"While climbing into trailer portion of truck, I/W fell and struck head causing concussion"*

Table 7. Top Injury Scenarios for Long-haul Truck Drivers, 2012.

1. **Securing/Opening/Closing/Adjusting (*n*= 93, 29%)**
   - *"Opening trailer doors and a load of tires fell on her"*
   - *"Employee hurt right shoulder while trying to close trailer doors"*
   - *"IW was closing trailer door. IW's right hand caught in hinge causing fracture"*
   - *"Shoulder strain/EE force closing trailer foor w shoudler/EE felt pain after"*
   - *"IW was loosening a strap of the truck, he slipped and fell and hurt left hand"*
   - *"Fell and hit trailer while tarping trailer/ Right shoulder strain"*
   - *"On the trailer strapping a load and the strap was hung and he pulled and it came loose and he fell backwards to the ground, injurying left knee"*
   - *"EE was tightening bungies when bunies broke, knocking EE off truck and causing injury to EE's head"*
   - *"Cranking landing gear on the trailer and was struck in nose by handle"*
   - *"Was cranking landing gear on trailer up and it sprang back and struck her in the face"*
2. **Lifting/Cranking (*n*= 57, 18%)**
   - *"EE strained back from repetitive lifting of packages"*
   - *"Strain/elbow/carrying furniture"*
   - *"Employee was unloading trailer causing back pain"*
   - *"While moving skids with a pallet jack injured neck and right shoulder"*
   - *"Using dolly to take refrigerator up stairs. Turned to check stair & felt pop in left hip"*
   - *"Picked up a deck board inside a trailer to put on a rack when he felt something in his right arm pull"*
   - *"A construction worker and myself were pushing their freight to the back of the trailer and my foot slipped"*
   - *"Driver squatted down to hook up hose and felt severe pain in left knee"*
   - *"IW was squatted to pick up trash in trailer and strained his right knee"*
   - *"Cranking down dolly legs on trailer. Strained mid-low back while cranking"*
3. **Maneuvering Into/Out of Truck Cab (*n*= 44, 14%)**
   - *"Fell while climbing out of truck. Right shoulder strain"*
   - *"Struck left knee on truck step when climbing into cab. Left knee contusion"*
   - *"Claims the weather was raining. He ran toward to truck step up to quickly and slipped"*
   - *"Strain right shoulder EE tripped exiting truck, grabbed seatbelt to break fall, felt pull in shoulder"*
   - *"Driver fell out of his truck suffering multiple body parts- contusion"*
   - *"Employee alleges getting in and out of truck causing knee pain"*
   - *"Claimant states that he slipped entering the truck and fell backwards hitting his head on the ground"*
   - *"Alleged knee sprain. EE reached down to exit truck and twisted knee"*
   - *"The claimant was climbing down from the truck when he slipped & fell & hit his head"*
   - *"Claimant slipped while exiting his truck and injured his leg"*

Biographical Sketch

Mark Chandler is a previous graduate of the University of Kentucky with a Bachelor of Arts degree in Psychology. He has served in two roles with the Kentucky Injury Prevention and Research Center (KIPRC): previously as the Communications Coordinator, and presently as the Project Manager for the Kentucky Fatality Asessment and Control Evaluation (FACE) Program. He is a member of the Council of State and Territorial Epidemiologists (CSTE), and will be delivering an oral presentation of the findings of this study at their national conference in June of 2015.

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